

thereto through ultrasonic junction and the like. Electrode terminals are connected to electrodes of the power element through aluminum wires. The power element, the electrode terminals and the metal block are sealed with a resin package while the metal layer of the insulating substrate remains exposed. An external heat dissipator is attached to the exposed metal layer of the insulating substrate.

REMARKS

Favorable reconsideration of this application as presently amended and in light of the following discussion is respectfully requested.

Claims 1-10 are pending in the present application. No claims have been added, amended or cancelled by the present amendment.

In the outstanding Office Action, Claims 1-5 were rejected under 35 U.S.C. § 103(a) as unpatentable over JP Patent No. 10-93015 (JP '015); and Claims 6-10 were rejected under 35 U.S.C. § 103(a) as unpatentable over JP '015 in view of JP Patent No. 2001-118961 (JP '961).

Claims 1-5 stand rejected under 35 U.S.C. § 103(a) as unpatentable over JP '015. This rejection is respectfully traversed.

The present invention as recited in Claim 1 is directed to a semiconductor device in which a semiconductor element and an electrode are joined to a first surface of a metal block through a jointing material. Thus, because the metal block having a satisfactory heat conductivity is provided at a position closer to the semiconductor element for generating heat than a position of a ceramic substrate as a major obstruction to heat conduction, a satisfactory heat dissipation characteristic is obtained (see page 5, lines 1-5).

In a non-limiting example, Figure 3 illustrates a semiconductor element 1 and an electrode 2 joined to a first surface of a metal block 3 through a jointing material 9 (see also Figure 4).

The outstanding Office Action states that JP '015 teaches a semiconductor element having a lead frame 13 joined to the first surface of a metal block in which the semiconductor element 11 and the lead frame 13 are joined to the first surface of the metal block 19 through a jointing material. However, in Figure 1 of JP '015, the lead frame 13 is not joined to the first surface of the metal block 19 (i.e., the surface where the semiconductor element 11 is joined), but is actually joined to the opposite surface thereof. Further, JP '015 does not teach or suggest any other electrode terminal being joined to the first surface of the metal block 19 (i.e., the surface where the semiconductor 11 is joined).

Regarding Claim 3, the outstanding Office Action states JP '015 teaches the metal block 19 and the ceramic substrate 18 being separated per an insulation unit. Figure 1 of JP '015 illustrates that the metal block 19 is separated per an insulation unit, but the resin insulation layer 18 is provided across all semiconductor elements 11 and is not separated per insulating unit.

Further, regarding Claim 5, the outstanding Office Action states that it would have been obvious to find the optimal gap between the metal block 19 and the semiconductor 11, because the solder or resin material is a known material. However, JP '015 does not teach or suggest that "a gap ... becomes wider as a distance from a center of the semiconductor element becomes longer" (as recited in Claim 5 of the present invention) is the optimal gap between the metal block 19 and the semiconductor 11. Also, although the optimal gap should be determined by considering known material such as solder or resin material, the

"gap ... becomes wider as a distance from a center of the semiconductor element becomes longer" in Claim 5 is not only determined by these known materials.

Accordingly, it is respectfully submitted independent Claim 1 and each of the claims depending therefrom are allowable.

Claims 6-10 stand rejected under 35 U.S.C. § 103(a) as unpatentable over JP '015 in view of JP '961. This rejection is respectfully traversed.

Applicants note JP '961 was made open to the public on April 27, 2001. The present invention claims foreign priority to Japanese Patent Application 2001-043439 filed on February 20, 2001. Therefore, JP '961 became open to the public after the present invention was filed and accordingly JP '961 is not a valid reference. An English translation of the claimed foreign priority patent is enclosed herewith to perfect the claimed priority date.

Accordingly, it is respectfully submitted independent Claim 6 and each of the claims depending therefrom are also allowable.

In addition, the Abstract has been amended to remove the reference numerals recited therein.

Consequently, in light of the above discussion and in view of the present amendment, the present application is believed to be in condition for allowance and an early and favorable action to that effect is respectfully requested.

Respectfully submitted,

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IN THE ABSTRACT

Please amend the Abstract at page 23, lines 3-17 as follows:

--It is an object to provide a semiconductor device having an improved heat dissipation characteristic. A power element [(1)] is mounted on and jointed and to a metal block [(3)] through a jointing material [(9)]. An insulating substrate [(4) consists of] includes a ceramic substrate [(6)] and metal layers [(5, 7)] formed on both surfaces of the ceramic substrate [(6)] and having thicknesses equal to each other. The metal block [(3)] and the insulating substrate [(4)] are provided per insulation unit of the power element [(1)]. The metal layer [(5)] of the insulating substrate [(4)] is joined to a surface of the metal block [(3)] through a jointing material [(10)] opposite to a surface thereof for forming the power element [(1)]. An electrode terminal [(2n)] is attached to a surface of [a] the metal block [(3n)] having a power element [(1n)] joined thereto through ultrasonic junction and the like. Electrode terminals [(2b, 2c)] are connected to electrodes of the power element [(not shown)] through aluminum wires [(8)]. The power element [(1)], the electrode terminals [(2b, 2b, 2c)] and the metal block [(3)] are sealed with a resin package [(11)] while the metal layer [(7)] of the insulating substrate [(4)] remains exposed. An external heat dissipator [(not shown)] is attached to the exposed metal layer [(7)] of the insulating substrate [(4)].--